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ADVANCES IN EVOLUTIONARY CULTURE THEORY

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INTRODUCTION

In this paper, I review recent attempts to formulate an evolutionary theory of cultural change. Historically, cultural evolution has had a bad name in anthropology, largely because the term has been used to describe unilineal schemes of social development and to promote the "biologicization" of the discipline. When defined and used appropriately, however, the term deserves a better fate. I argue that the conceptual systems we call cultures do evolve in the important, specific sense of "descent with modification," and that anthropology cannot afford to deny or ignore this fact. On the contrary, I suggest that there is much to be gained by adding an evolutionary perspective of this kind to cultural theory and analysis. The last decade has witnessed a number of pioneering efforts in this direction; here I review five of the leading theoretical formulations, pointing out their similarities, differences, and specific contributions to the evolving subfield of evolutionary culture theory.

The Meaning of "Evolution"

The word "evolution" has meant many things to many people (e.g. see reviews in 27, 28, 42, 44, 129, 155, 188, 205). Swayed by Darwin's simple yet seminal rendering, "descent with modification" (63), I consider evolution to have occurred in any set X whose elements (X_1, X_2, X_3, etc) are all related by descent—that is, by hereditary derivation from a common ancestor. Using

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this definition, together with a suitable conception of heredity, one can argue that many things evolve: for example, designs (191), technologies (57), texts (34, 156), languages (90, 91, 197), knowledge (35, 37; but see debates in 97, 163), ideas and theories (111, 158, 201), whole disciplines (80, 202), even Darwinism itself (166, 193). But within this "wider domain of evolutionary thought" (152), surely the most familiar and thoroughly studied example is that of *organic evolution,* the proposition that all living organisms are related by descent. By this definition, it should be noted, the term "organic evolution" simply describes a particular kind of relationship among species—the "the link of generation" as Darwin put it (63:344). It does not endorse any particular theory to explain that relationship, nor does it stipulate any particular pattern or rate of descent among related organisms (see also 81:Ch. 1).

In like manner, I take *cultural evolution* to refer to the proposition that all human cultural systems are related by descent to a common ancestral culture. By cultural systems I mean the widely shared conceptual systems of human populations—"the framework of beliefs, expressive symbols, and values in terms of which individuals define their world, express their feelings, and make their judgments" (84:145). Swayed by the arguments of recent culture theorists (e.g. 84, 120, 121, 189), I specifically limit the meaning of "culture" to ideational phenomena—that is, to Popper's "World 3" (158:Ch. 4;159:Ch. 38)—and thus include the values, ideas, and beliefs that guide human behavior, but not the behavior itself. By descent, I continue to mean hereditary derivation, though in this case the pertinent heredity is that obtained from the social transmission of cultural information (on culture as a second or "paragenetic" inheritance system, see 29, 77, 108). As with organic evolution, I do not take cultural evolution to refer to any particular model or theory of cultural descent; I take it to mean simply that human cultural systems have not been separately created but make, instead, another example of what Darwin called "one grand system . . . [all] connected by generation" (63:344). Put differently, cultural evolution is the claim that all cultural systems since the first one have had predecessors. Not one has appeared full-blown and wholly new.

It is possible, of course, and some might say probable, that the cultural systems known to anthropology trace back to multiple independent ancestors. Following parallel arguments in the history of evolutionary biology, this might be called the thesis of "cultural polygenesis" in contrast to the "monogenesis" assumed in my statements above. Although I think one could easily revise the definition of cultural evolution to accommodate polygenetic origins (Darwin, too, was cautious in this regard; see 63:344), I nevertheless personally favor cultural monogenesis for three reasons. First, comparative study reveals an extensive array of properties—general though they may be—common to all human societies ever studied (e.g. 148); moreover, many of these properties are, strictly speaking, either part of local cultural systems

or at least culturally influenced (e.g. etiquette, funeral rites, incest taboos, inheritance rules, religious ritual, etc). It seems to me unlikely that all of the cultural elements in this array are shared around the world by virtue of diffusion or independent invention (although they may well be true in particular cases). Surely *some* must owe their commonality to descent from common origins, particularly given recent evidence that modern human populations spread and diversified outside of Africa beginning only about 100,000 years ago (38, 39, 49, 195). Because of their celebrated near universality, with only "special case" exceptions (109, 204), incest taboos are one obvious candidate (for further suggestive evidence see 77:Ch. 6), as are the greater kinship systems of which they are part.

Second, there is an impressive and growing list of "global cognates" among the world's languages (15), not to mention other, though perhaps more controversial, language universals in phonology, word structure, and syntax (e.g. see 93, 95; on their explanation, see 100). According to one recent study (15:7), the convergent etymologies of these cognates (which include words for basic human body parts and associated functions, such as "nose; to smell," "knee; to bend," or "finger; one") are so persuasive that the question now is "not whether all the world's languages are related, but why it took the linguistic community so long to recognize this obvious fact." (Early arguments for language monogenesis are given in 63:422–23; 64:59–62; and 203).

Third and most suggestive of all, recent work has demonstrated a strong correlation between hierarchical clusterings of human populations based on genetic similarities and those based on linguistic ones. Although a comprehensive "genetic" (i.e. descent-based) classification of the world's languages is already an impressive statement about cultural evolution (179), that classification takes on still further significance when, as Cavalli-Sforza and coworkers have shown (49), it matches in broad outline the "family tree" of human genetic divergence from one common ancestral population. Surely this finding and the other two above are best viewed as tentative, and thus as subject to major improvements in data and methods in the years ahead. And surely language is only one aspect of culture, albeit an important one, playing a role analogous to DNA in organic evolution (see 6:Ch. 22; 144; 145:Ch. 3). Still, these studies provide more evidence for cultural monogenesis than Darwin had when he suggested "that probably all the organic beings which have ever lived on this earth have descended from some one primordial form, into which life was first breathed" (63:484).

What Evolutionary Culture Theory Is

Evolutionary culture theory (ECT) is a collection of arguments seeking to explain the "descent with modification" of human cultures. It is, in a word, a theory of cultural phylogeny. It seeks answers to questions like the following:

What are the predominant mechanisms of cultural change? How does a new culture get started? How and why does an existing culture assimilate or die out? What is the particular historical branching pattern or "cladogram" of human cultures? And why have there emerged so many different cultures in the course of the human career? In attempting to answer these and related questions, evolutionary culture theory offers a dimension of cultural analysis that I view as complementary to other kinds of anthropological inquiry. For example, ECT complements the work of symbolic or interpretative anthropology, in which cultures are studied as "texts" to be explicated; likewise, it complements the work of political economy approaches, in which cultures are viewed as ideational toolkits for political advantage. In ECT, the focus is on how and by whom the "text" has been written and revised so as to have its particular meaning and confer its particular advantage. It is, in this sense, a theory of how cultures have been "written." The endeavor is far from incompatible with other recent efforts toward a transformational theory of culture history (e.g. 154, 185, 186).

Although ECT has significantly improved in recent years, I hasten to point out that many of the underlying arguments have themselves descended with modification from earlier versions. Central among these is the basic proposition that cultural systems exhibit a branching pattern of descent, much like the phylogenetic tree of a group of closely related species. In a recent treatise on "evolution and social life," Ingold (113:33), for example, notes that "The idea that the course of cultural evolution can be represented as a branching tree, bush or vine rests on a now very well worn analogy between human cultures . . . and the Darwinian conception of organic species," an analogy that Ingold traces back to the likes of Childe (51:166ff), Murdock (148:136), and Kroeber (126:259–61). Of these authors, Kroeber is perhaps the clearest and most explicit on the subject, representing the descent relationship as "the tree of culture" (126:260) and emphasizing that "The many past and present cultures grade into one another in space and time in a vast continuum" (127:10). Like Linton before him (131:372–93), Kroeber clearly recognized the promise of a descent-based approach to the analysis and classification of cultures.

But to say that the principle of cultural descent has long been recognized in anthropology is not to say that it has been well and widely used. On the contrary, aside from efforts in the subfield of comparative historical linguistics (such as the Greenberg classics, 92, 94, and 96), surprisingly few studies have put a descent-based logic to good use (see also 21 and 178). True, there are notable exceptions: for example, (*a*) the "genetic model" of the "new" comparative mythology (132, 133), which has detected striking correspondences among the myths of Indo-European speaking populations (e.g. 130: Chs. 4–6); (*b*) the comparative regional analysis of in-law avoidance beliefs (70) and kinship systems (19, 78, 82, 107, 108, 143) believed to be related to

a common ancestral heritage; (*c*) the use of a similar "genetic model" in the historical reconstruction of ancestral cultures and social systems (1, 2, 119), such as proto-Uto-Aztecan (177), proto-Maya (207), or proto-Indo-European (132); and, in the reverse direction, (*d*) the use of an evolutionary framework for understanding the differentiation of closely related cultural systems from their common ancestor (e.g. 122, 123, 164, 165; see also 85, 86, 183, 184). Of course even these exceptions would have come up empty handed were descent characteristically unimportant in culture history. Nevertheless, it is clear that the approach has yet to stimulate broad interest within anthropology. Indeed, it was not until Ruhlen's (179) recent classification of languages that we had even an approximate comprehensive phylogeny of the world's cultures. Virtually all other compilations have been based on geographical distribution, even when not designed as atlases per se (e.g. 150, 151, 160; but see also the unfinished work by Kroeber, 127).

Among other reasons, an evolutionary dimension of cultural analysis has been slow to attract interest because of a problem I will call the "diffusion issue." For years, anthropologists have recognized four major kinds of similarity among human cultures (e.g. see 20:285–88; 112:567–70; 131:Ch. 21; and 181). These are *coincidence* (i.e. similarity by accident or chance), *analogy* (similarity by convergence or independent invention), *homology* (similarity by descent), and one I call *synology* (similarity by diffusion). Two of these terms, "analogy" and "homology" (and arguably "coincidence" as well), are used with similar meanings in evolutionary biology (e.g. see 30, 209); indeed, they are probably "loan words" from evolutionary biology (as can be seen in 64:59–60), making them likely examples of cultural synology. At any rate, the fourth kind of similarity—i.e. similarity by diffusion—has a special significance in anthropology, largely as a product of reaction against the infamous "classical evolutionary anthropology" of the late 1800s (which, ironically, specialized not in descent relationships, as the label might seem to imply, but in a particular form of cultural analogy, as discussed further below). "Diffusionism" not only supplanted "evolutionism," it also virtually eclipsed the study of cultural descent, leaving many scholars with the impression that diffusion or "acculturation" totally overwhelms all other potential relationships between cultures (for a forceful statement of this position, see 22:211–25). Even Kroeber (126:260–61), in his discussion of the "tree of culture," emphasized diffusion at the expense of descent. "A branch on the tree of life," he wrote, "may approach another branch; it will not normally coalesce with it. The tree of culture, on the contrary, is a ramification of such coalescences, assimilations, or acculturations . . . [and thus] the specific processes of life and the specific processes of culture are drastically different." No doubt diffusion and synology *are* important among cultures, as a memorable passage in Linton (131:326–27) makes clear (see also 31, 110,

175). The issue is just how important. In evolutionary culture theory, the claim is that descent generally comes first and remains, through any and all subsequent diffusion, a significant, analytically revealing relationship among cultural systems. I will call this hypothesis "the primacy of descent." Descent, after all, can be regarded as an internal diffusion from cultural forebears: The source is different, but the process—the social transmission of cultural information—is the same in both cases.

What Evolutionary Culture Theory Is Not

Before proceeding, it may also be instructive to point out what evolutionary culture theory is not. First, it is not, in my usage, a body of theory about stages of societal progression, integration, or complexity, as in the "classical evolutionary anthropology" mentioned above (and reviewed in 43, 69; 99:Chs. 6–7), in the "neoevolutionism" of the 1950s and 1960s (reviewed in 72, 153), or in recent theories of "social evolution" (e.g. 98, 118, 141, 187). These formulations examine cumulative changes in the structure or organization of human societies but generally fail "to distinguish analytically," as Geertz (84:144) among others urges, "between the cultural and social aspects of human life, and to treat them as independently variable yet mutually interdependent factors." Surely, the emergence of increased social stratification in a population, to take one example, can and does have profound influence on the evolution of its religious beliefs, legal precepts, kinship and inheritance conventions, and so on. And surely there is much to be learned about the dynamics of cultural authorship from these effects. But just as surely, culture and social structure are not the same thing (see also 7); temporal changes in social relations—as important as they are—should not be construed as cultural evolution.

Still more important in my view is the fact that social-evolution arguments are characteristically typological rather than genealogical or descent based. In nearly every case their goal is to validate a social trajectory of parallel stages (e.g. the familiar sequence: band, tribe, chiefdom, state) across a broad cross-cultural sample. This is attempted through a deliberate search for similarities that cannot be traced to common origin and shared descent. Regularities thus discovered are often interesting and provocative, and they may well help us to identify underlying commonalities of human experience that foster convergent social structures; but stagelike sequences are not intrinsic to evolution as the term is defined here. (They are, however, intrinsic to a Spencerian conception of evolution which, to my mind, is archaic and prejudiced; compare discussions in 44; 87:Ch. 3; and 194:Ch. 5.) Blute (21) put the matter succinctly: Despite the claims of stage theorists, a theory of descent with modification in cultural systems has remained, until very recently, "untried."

Second, from my perspective, evolutionary culture theory is not human sociobiology in any of its various guises. To begin with, it is certainly not equivalent to the classic or "old" sociobiology of the 1970s (41), accurately defined as "the application of evolutionary biology to the social behavior of animals, including *Homo sapiens*" (9:2). Although it is true that the early sociobiology debate (see 40, 83, 124, 147, 180) stimulated new interest in evolutionary culture theory, recent work in the latter seeks neither to apply evolutionary biology nor even to study social behavior per se. Rather, it seeks to formulate a comparable set of principles for understanding the dynamics of evolutionary change in cultural systems. In so doing, there will obviously arise many analogies, especially imperfect and partial ones, between organic and cultural evolutionary theory. But these analogies will come to light because there is bona fide evolutionary change in both realms, not because evolutionary biology can be successfully applied to both of them. Given the obvious differences between genetic and cultural transmission (summarized, for example, in 29:Chs. 1 and 3; 47:Ch. 1), there is surely no reason to expect complete analogy or to expect that the application of evolutionary biology will produce an adequate evolutionary theory of culture.

Neither is evolutionary culture theory equivalent to the improved human sociobiology of the 1980s (see reviews in 26, 66), also called "evolutionary biological anthropology" (25) and "Darwinian anthropology" (199). As a general rule, studies of this kind have focused upon the reproductive consequences of human social behaviors (good examples are given in 17, 50; see also 89:Ch. 9). Many of them are empirically based, rigorously scientific, and quite revealing about the reproductive implications of human behavior. But as a general rule, they do not offer an evolutionary theory of culture (an important exception is the "cultural and biological success" model discussed below).

Finally, evolutionary culture theory is not the same as "evolutionary" or "Darwinian" psychology (55, 58, 60, 199, 200). Described as "the investigation and characterization of the innate psychological mechanisms that generate and regulate behavior" (200:32), this relatively new endeavor fashions itself as the missing link between organic evolutionary theory and human social behavior. What fills the gap, proponents argue, is a wide range of "Darwinian algorithms"—"the specific adaptive psychological properties of our species: things like life-historical changes in parental feeling, sexual jealousy in heterosexual transactions, nepotistic discrimination, the desire for social status and respect," and so on (62:109). The goals are laudable; the arguments are an improvement over "apsychological" Darwinian anthropology (199); and the "evolution mindedness" and "selection thinking" are stimulating and fruitful (see especially 60, 61). Moreover, early results support the claim for a textured psychology of organically evolved, domain-

specific mechanisms (including, for example, a "look for cheaters" algorithm; 56:86), although in some cases cultural homology and synology are far from ruled out (e.g. 32). Surely knowledge of the evolved mechanisms of mind will be crucial to ongoing efforts in evolutionary culture theory; and surely the two approaches ought to be complementary and compatible. Nevertheless, the two are not the same: Evolutionary psychology, like human sociobiology, is not the study of descent with modification in cultural systems, nor does it usually pretend to be. [The one exception is an argument (200:29) that misconstrues culture as "the cross-individual patterns of similarity" that are produced by "individual cultures" as outputs of evolved psychological mechanisms.] Both areas of inquiry are essential, in my view, to the task of understanding human social behavior.

In summary, evolutionary culture theory stands apart from these other lines of inquiry by virtue of (*a*) its treatment of culture as a second evolving system of information inheritance, separate from (though interacting with) the genetic inheritance system; and (*b*) its proposition that historical derivation or descent remains a significant and revealing relationship among cultural systems. As an evolving entity itself, ECT clearly shares many features with its predecessors and contemporaries, whether they be similarities by descent, diffusion, convergence, chance, or, as seems likely, all four. Nevertheless, I contend that differences in the basic assumptions and propositions of ECT make it worthy of separate classification.

MAIN QUESTIONS IN EVOLUTIONARY CULTURE THEORY

Let us now consider two of the main questions facing ECT today. Each has an approximate counterpart in contemporary evolutionary biology which I have drawn upon for conceptual guidance and inspiration.

Differentiation

The first question can be called the "differentiation question:" if it is true that all cultural systems are related by descent, then what has caused their differentiation into the more than 4000 distinct cultures known to anthropology? (This figure is based on estimates in 151, 179, and 160; the latter provides locations and basic bibliography as well as a discussion of problems inherent in such enumerations.) What processes or forces have acted over the course of human history to promote a differentiation of this magnitude? Why, for that matter, is there not simply one global human culture?

There is, of course, no simple answer. Following the lead of organic evolutionary theory (e.g. 146:400), however, we might go on to subdivide differentiation into two main components, namely, *diversification,* or the

branching of a given culture into two or more "daughters" (a process also called "culture birth"), and *transformation,* the sequential change within any one culture, as may result from internal innovation or diffusion from outside. We can then ask whether one of these two components has predominated in the overall descent with modification of cultures. Has the global phylogeny of cultures been shaped mostly by diversification (together with extinction), making it bush-like in appearance? Or has the principal force been cumulative sequential change within branches, making the general picture more like a tree (as in Kroeber's analogy) or even a ladder (cf 87:Ch. 6)? Or is that phylogeny, in fact, a fairly even mixture of both?

The topic of differentiation is clearly an important one, loaded with implications for social and cultural theory. But it is equally clear that we are a long way from having definitive answers. Among the problems are lack of detailed studies (though resolution is improving, as in 96, 143) and thorny issues with respect to time scales and the metrics of cultural divergence. In the meantime, let me propose an additional assumption, namely, that diversification itself is actually the product of some degree of cultural isolation—that is, some impediment, full or partial, to the free interchange of values, ideas, and beliefs between groups of people (see 102)—together with the independent or semi-independent transformation of the isolated systems. By this assumption, the key to understanding evolutionary change becomes transformation.

Transformation

How can we best characterize the process of sequential change within cultures? For clarity, let me further subdivide this question into two issues, one dealing with the temporal pattern of change, the other with the matter of mechanisms. Consider tempo first: Does transformation occur primarily "by the accumulation of innumerable slight variations" within long-established systems, analogous to the predominant gradualism of Darwinian theory (63:459)? Or is the principal pattern one of abrupt and episodic change, followed by a relatively long period of stasis, analogous to the theory of "punctuated equilibrium" in evolutionary biology (reviewed in 190)? Is most transformation, in other words, "a rapid transition between stable states?" (88:90) Or, again, does the record show a mixture of the two?

Opinions and interpretations vary widely on this issue (e.g. compare 33 and 68). One reason is the lack of systematic longitudinal studies; we simply need a closer, longer look at more cases. One good place to study transformation is in the context of culture birth because, sooner or later, the "daughter" culture(s) will change away from the "parent." But here, too, more work is needed, particularly since it is difficult to generalize from the few studies we now have (e.g. see 67 on the abrupt, revolutionary birth of Hutterite Anabaptism; see 117 and 192 on the drastic "deculturation" of the Sirionó from

ancestral Tupian stock, followed by the apparently gradual divergence of Yuquí from Sirionó). Surely we know that gradual and punctuational change are both possible; and surely punctuational change, by definition, causes greater net transformation when it occurs. What we need are additional data and theoretical treatments to clarify the relative overall importance of these two patterns of change.

Happily, there is more progress to report on the issue of mechanisms, or what I will call the "main means" question. In answer to the analogous question of what forces have guided the descent with modification of living organisms, Darwin (63:6) proposed "that Natural Selection has been the main but not exclusive means of modification." Similarly we may ask what process or processes have been the main means of cultural transformation. Is there, in fact, one process that warrants recognition as the "predominant Power" in cultural change?

Five Recent Approaches

In the last 10–15 years, there have been a number of attempts to formulate a transformational theory of culture and thus to answer the main means question. In the interest of tractability, I focus on five of the largest and most complete of these recent treatments [elsewhere (77), I review earlier related arguments by Murdock (149), Campbell (36), and others]. These five are (*a*) the "Darwinian theory of culture" by Boyd & Richerson (29, 167–170); (*b*) the "cultural transmission model" of Cavalli-Sforza & Feldman (as summarized in 47 and 48; see also 45, 46, 101); (*c*) my own "coevolution model" (77; descended with modification from, e.g., 73–76); (*d*) the "cultural and biological success" model, named by Irons (115) and developed into a comprehensive model by Barkow (13; see also 11, 12, 14, 103, 104, 114, 116, 206); and (*e*) the "gene-culture transmission model" of Lumsden & Wilson (137, 139, 140; see also 135, 136, 138, 140). In so doing, I emphasize that there are many other valuable contributions, both books (e.g. 3, 5, 10, 14, 24, 54, 59, 79, 106, 125, 134, 162, 198) and substantial articles (e.g. 4, 23, 18, 36, 52, 53, 65, 71, 128, 142, 157, 171–174, 176, and 182). Although the field awaits, indeed beckons, full review by historians of science, selective discussions of this broader literature can be found in Barkow (13), Durham (77), and Ingold (113).

Before discussing the various answers to the main means question, let me briefly summarize a number of features common to all five models. First, as befits ECT, all five assume that culture constitutes a bona fide "system of inheritance," distinct from but interacting with the genetic inheritance system. Implicitly or explicitly, culture is therefore treated as a second "track" of information conveyance whose relationship to human behavior is roughly symmetrical to that of the genes; both are seen as instructing rather than

determining human action. Beyond that, all five formulations underscore the more-or-less obvious differences between genetic and cultural inheritance: that cultural inheritance spreads by social transmission, and thus by teaching, learning, and imitation, rather than by reproductive transmission; that cultural inheritance can therefore be continuous and changeable during a given generation; that it can be "horizontal" (between peers) and "oblique" (from non-parental elders) as well as "vertical" (from parent to offspring); and that it can involve a ratio of "transmitters" to "receivers" that varies all the way from many-to-one to one-to-many (see especially 47:Ch. 1). Moreover each model adheres, and reasonably so, to the assumption of "natural origins" (as in 29:13)—that is, to the assumption that our "capacity for culture" (i.e. the full set of culture-enabling properties of mind and body, including Darwinian algorithms) has itself evolved through Darwinian natural selection operating upon the genes of our forebears.

In addition, each of the five formulations agrees with the basic assertion that cultural transmission is everywhere fragmentary or "piecemeal," such that whole cultural systems are rarely, if ever, conveyed (or not conveyed) as all-or-nothing units. Instead, the models assume that cultures are taught and learned in diverse subsets or "bundles" of varying size and content, as illustrated, for example, by the diversity of cultural diffusions. Further, each of the models assumes that variation—whether from innovation, diffusion, or both—sometimes exists among the bundles of a particular kind, providing cultural options or alternatives at least in some circumstances. Aside from this agreement, however, opinion differs significantly about the nature of bundle contents; Lumsden & Wilson (137:7), for example, include in their notion of bundles all "transmissible behaviors, mentifacts, and artifacts," whereas I favor strictly ideational contents (77:Ch. 4). In addition, there is certainly no closure on the question of what to call these cultural variants. Inspired by the analogy to genes, proposals include "culturgens," "memes," "traits," and, in the wider literature, many others (e.g. see 8, 105, 196). Opinion also differs on just how much variation among bundles is typically available in human populations. As one example, a broad range of alternative culturgens are featured in the Lumsden & Wilson model (e.g. 137:7–9), while Cavalli-Sforza & Feldman assume that tradition and social structure generally make for few, if any, options (47:62–65). Similarly, opinion differs about the evolutionary influence of individual agency and free choice, particularly in regard to customs that are oppressive or manifestly suboptimal (maladaptive) for individual carriers. In this regard, I contrast my own view, namely that *most* culturally evolved maladaptations are imposed with little or no choice (77:Ch. 7), with the exclusively choice-based mechanisms and explanations of maladaptation in the Boyd & Richerson theory (e.g. see 29:Ch. 8 on "runaway" and "drift-away" processes). Because cultural transmission is not

rigidly biparental like genetic transmission, it can readily be controlled, manipulated, and maneuvered. The five models differ in their portrayal of the intrinsic politics of cultural evolution.

Finally, all five models regard cultural transformation as change through time in the relative frequencies of variant bundles among the culture carriers of a population. This, too, is a parallel with population genetics: A culture is said to evolve as some of the existing alternatives gain carriers and others lose them. Moreover, the five models agree that while many, many variables may affect the changing frequencies of alternatives, the most important category of such variables includes those that cause different rates of social transmission among the bundles themselves. In other words, the models all agree that cultures change because some options are more readily transmitted and adopted per unit time than others. Where the theories differ, and where some of the main disagreements lie, is in answer to the "main means" question. Of all the forces contributing to the differential transmission of bundles, which, if any, has predominant power?

In the interest of brevity, let me summarize the different positions of these theories using a tentative inventory (drawn from 77) of main forces in cultural evolution (for other inventories see 29:9–11; 47:351; and 137:258–63). Although the match between inventory items and "main means" arguments is by no means perfect (e.g. some arguments span several entries), this procedure brings the conceptual differences among the five approaches into sharp focus. First, let me distinguish two general categories of transformational forces, namely "nonconveyance forces" (category A) versus "conveyance forces" (category B). The former are the more easily described because these are processes that primarily introduce variation rather than disseminate it. They include innovation, diffusion, migration, and chance effects or cultural drift. By providing means for the repeated introduction or loss of bundles, these nonconveyance forces influence the frequencies of cultural variants in human populations. But by themselves, as I think all five models agree, category A forces are not strong candidates for "main means," although they may well be important in special cases.

The second category, conveyance forces, includes bones of greater contention. For convenience, let me subdivide this category into three subcategories, namely (B.1) transmission forces, (B.2) the "natural selection of cultural variation" (after 168), and (B.3) "cultural selection" (after my own earlier arguments; e.g. 73–75). Consider first the transmission forces, a subcategory championed by the "cultural transmission model" of Cavalli-Sforza & Feldman. Among other contributions, Cavalli-Sforza & Feldman have shown that transmission in culture is "not as inert as in biology" (47:351) where, since the formulation of the Hardy-Weinberg Law (discussed in 77), it has been known that genetic inheritance according to Mendel's laws does not cause evolution-

ary transformation in gene pools. In contrast, Cavalli-Sforza & Feldman demonstrate that cultural transmission readily violates the Hardy-Weinberg Law: For example, even when all else is equal (including desirability), a consistent difference, between variants, in the ratios of teachers-to-learners is sufficient to drive up the frequency of one variant at the expense of others. Cavalli-Sforza & Feldman give credit to other forces in the inventory, including cultural selection (see 47:362–66); but their focus is clearly upon the "pervasiveness" and "power" of transmission forces (47:65 and 359). They conclude, speaking in terms of "traits" (their bundles), that "the mode of transmission is of great importance in determining the rate of change of trait frequencies in populations," such that even some of the major differences between genetic and cultural evolution are "predicted by the mechanisms of transmission" (47:356–57).

Consider, next, category B.2, "the natural selection of cultural variation" as championed by Boyd & Richerson in their Darwinian theory of culture. For purposes of the present discussion, I adopt Boyd & Richerson's terminology and let "natural selection" refer not simply to preservation by individual *reproductive* advantage (its original meaning, after 63) but more generally to preservation by individual-level *transmission* advantage (thus including differential teaching in addition to differential reproduction). Defined this way, natural selection, they argue, "will favor cultural variants that make individuals effective teachers, even at some cost to success at having children. [It] will tend to optimize an individual's total ability to transmit cultural variants to others" (168:431). Setting aside the problems of calling it "natural," this force is defined by a clever extension of Darwin's logic; it certainly is selective of certain "traits" (their bundles, too); and it is another plausible, though unproven, explanation for the demographic transition, for example, or religious celibacy (see 29:Ch. 6; 168). Moreover, their "natural selection" is actually but one of three forces identified as "autonomous" (i.e. not genetically inherited) and "maladaptive" (i.e. not always favoring reproductively optimal traits). The others are "frequency dependent bias" (i.e. adopt the majority preference) and "indirect bias" (adopt the preference of someone you admire), and it is really the three of these together that the authors promote as "main means." Owing to these three forces, the authors claim, "the existence of culture causes human evolution to be fundamentally different from that of noncultural organisms" (29:99).

Category B.3 includes the various forces of cultural selection, defined as value-driven decision-making or simply "preservation by preference." B.3 therefore includes a wide range of processes whereby an evaluation of options by individuals or groups results in their having different rates of social transmission. In the interest of analytical clarity, I further subdivide this category using two conceptually orthogonal axes (a third could be added to

include the size of the social unit making the decision). The first, or "decision" axis spans the range between completely "free choice" (i.e. preservation by election) and complete imposition (i.e. preservation by force). The process remains decision-making all along this range, but at one pole the decision makers are autonomous and unconstrained socially (though still constrained culturally, by such things as limits of technology and blinders of conventional thought) while at the other pole, the decisions are preempted by others who use some form of power to impose their choice and ensure compliance (see 77 for more on this important axis).

The second, or "evaluation" axis, conceptually at right angles to the first, subdivides all degrees of choice and imposition into two groups according to the nature of the governing values. Here I make a distinction, revised from Pugh (161), between "primary values"—decision criteria built into the nervous system by natural selection (Darwin's meaning) through the design of the senses, internal rewards, and mental processes—and "secondary values"—the derived "surrogate" values, borne of past experience and shared via social transmission as part of a greater cultural system. The latter, in a word, are cultural values. The second axis therefore spans the range from decisions that are, in theory, 100% primary value driven to those that are, in theory, 100% secondary value driven, with most real-life decisions, no doubt, somewhere in between (reflecting some mix of primary and secondary values). Finally, using this second axis, let me distinguish subcategory B.3.a, "primary value selection" in which decisions are governed mostly by primary values, from subcategory B.3.b, "secondary value selection," wherein socially transmitted secondary values play the larger role and hold sway (one could well include a third group comprised of the "muddle in the middle").

Drawing on this distinction, then, I suggest that the gene-culture transmission model of Lumsden & Wilson posits as its "main means" the decision-making process of primary value selection. According to Lumsden & Wilson, gene-culture transmission is defined "as transmission in which more than one culturgen [their bundle] is accessible and at least two culturgens differ in the likelihood of adoption because of the innate epigenetic rules" (137:11). The latter, in turn, are defined as "genetically determined procedures that direct the assembly of the mind . . . and affect the probability of using one culturgen as opposed to another" (137:7). The examples they offer include discussion of a "cultural choice" with respect to avoidance of inbreeding. They argue that one culturgen, "incest avoidance" (meaning the behavior, not the prohibition) is generally chosen over its alternative, "incestuous relationship," because individuals have a "strong intrinsic preference" (the Westermarck aversion) for the former (137:151). Although the model does not address the pertinent *socially transmitted* "culturgen," namely the incest taboo and its variable

extensions and sanctions, it is in all other respects a good example of primary value selection.

Category B.3.b, secondary value selection, is my own nomination for main means. My argument is not that the other forces in the inventory are conceptually flawed in some way, or are insignificant as forces of cultural change. On the contrary, I am convinced that transmission forces, natural selection, and primary value selection all contribute to transmission differentials. But if we ask what is generally the most reliable way for a bundle to attain high suitability for replication (or high "cultural fitness") within a particular cultural system, I bet as follows: Compared to its alternatives, the bundle must receive the best overall evaluation in terms of the previously evolved secondary values already in the cultural system of the given population. My rationale (explained more fully in 77) is this: The evolution of a "capacity for culture" with effects on behavior as powerful as those of our human capacity would seem to require the concomitant evolution of an ever-more effective control system. Guided "plasticity" would always be favored over "total plasticity," particularly if the cultural system were to become successfully and increasingly self-guiding. But this, in turn, would require that the various forces of cultural change (including primary value selection, natural selection of cultural variation, etc) produce more and better secondary values whose effect was to shape decisions that were generally, though not perfectly, congruent with the value criterion of natural selection. In other words, if natural selection increasingly turned control, so to speak, over to culture, it was because culture, as a general rule, did a better job.

For examples of secondary value selection, let me return again to Boyd & Richerson's three "autonomous" forces: frequency-dependent bias, indirect bias, and (their) natural selection. As described by Boyd & Richerson, each of these processes amounts to a special case of secondary value selection, driven by a socially transmitted criterion that has itself evolved to prominence within the given cultural system (see e.g. 29:259–61). The processes work because the pertinent values ("adopt the majority preference," "adopt the preference of someone you admire," and "strive for positions of social influence")—all assumed to be secondary—are given special, even obsessive, weight by the members of a particular population at a particular time. That these and other derived surrogates should sometimes produce maladaptations is fully to be expected. But they certainly do *not*, in my view, make human evolution "fundamentally different." Not only does organic evolution produce maladaptations of its own (the classic case being sickle cell disease), but the record shows that Darwin named his main means in order to mark its similarity to the value-guided decision-making of our own "power of selection" (63:61).

Finally, let us turn to the cultural and biological success model as de-

veloped by Barkow, Irons, Betzig, and others. In my estimation, admittedly weighted by Barkow's recent treatment (13), this model, too, nominates secondary value selection as its candidate for main means. But the nomination, in my assessment, is only a partial one. The model assigns causal priority to a single specific secondary value—albeit a good and widely applicable one—namely, "culturally ordered and symbolically evaluated self-esteem/prestige" (13:199). In Barkow's account, the argument runs as follows: Human beings seek prestige because our species has "been [naturally] selected to do so" (13:225). This has happened, he continues, through the process of sexual selection (i.e. differential reproduction caused by mate preferences), which effectively transformed "primate-type agonistic dominance" into "human culturally ordered, symbolic prestige systems" (13:180), and put the "neurophysiological underpinnings" of agonistic behavior to work in the name of striving for prestige. Consequently, we are driven to pursue whatever is locally and culturally defined as successful; we internalize traditional "prestige criteria;" and these lead us to prefer and adopt certain cultural "traits" (Barkow's bundles) over others. The argument is commendable for its "vertically integrated hierarchically organized structure of processual explanations" (13:227), and it certainly correlates with data from a number of non-Western societies (e.g. 16, 115). Moreover, it provides a plausible hypothetical account of the evolutionary emergence of prestige-related secondary values. However it also collapses complex systems of cultural values into a single, one-dimensional scale. Barkow has a point: The social sciences "are not to be replaced by biology but to be made compatible with it" (13:213). In the attempt to find this compatibility, however, one must not oversimplify.

CONCLUSION

In this review I have attempted to argue the case for an evolutionary theory of cultural change. My main points can be summarized as follows:

1. The conceptual systems we call "cultures" may be related in many complex ways. They may be related, for example, by diffusion or "borrowing," and they may be related by descent (by hereditary derivation from a common ancestral culture). In addition, cultural systems may also *appear* to be related because of coincidental similarities or similarities produced by independent convergence.

2. Evolutionary culture theory is based on the premise that, however else they may or may not be related, all cultural systems are related by descent. In other words, a long and unbroken chain of cultural transmission connects each of the world's extant cultural systems with a single common ancestor; howev-

er remote and obscure the ties may be, all cultures have "descended with modification" from this one original culture.

3. Evolutionary culture theory (ECT) is a collection of arguments that seek to explain this process of "descent with modification" in cultural systems. It is not to be confused with efforts to find universal, stepwise trajectories of social complexity or integration (as in so-called "cultural evolutionism"), nor with attempts to apply genetic selection or other components of evolutionary biology to the analysis of human social behaviors (as in sociobiology), nor even with the effort to elucidate our species-typical "Darwinian algorithms" of the mind (as in evolutionary psychology), although insights and lessons from these endeavors will surely prove helpful, sometimes essential, to the cause.

4. At present, ECT does not have conclusive answers to offer in response to questions about differentiation (Why are there so many different cultures? Why, for that matter, aren't there more?) or transformation (Do cultures change primarily in a cumulative, gradual way, or through intermittent bursts of rapid transition?). More work has been done in attempting to answer the "main means" question (What are the most important forces of cultural change or modification?).

5. Recent theoretical formulations in ECT share many features, whether by descent, diffusion, independent innovation, or all three. All take cultural evolution to entail sequential transformation within a second system or "track" of information inheritance; and all view transformation as a product of the differential social transmission of some sort of cultural variants or "bundles" within human populations. Opinion is divided, however, about just how to characterize these bundles and their relationship to the larger conceptual system/culture.

6. Opinion is also divided about the main processes or forces that cause differential social transmission. Candidates include transmission forces (in which successful variants are preserved by an advantage in the transmission process), "natural selection" (in which successful variants are preserved by an actual reproductive advantage or, by extension, through a teaching or transmission advantage), and cultural selection (in which successful variants are preserved by a preference advantage, whether one's own or someone else's that has been imposed).

7. Additional theoretical work, particularly on the relationship between social structure and cultural change, and more and better case analyses are required for further advances in evolutionary culture theory.

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